

What is claimed is:

CLAIMS

1. A device for delivering an aerosolized compound,  
the device comprising:

5 a reservoir that stores the compound;

a system comprising an entry port and an element  
to generate particles of a desired size for ejection from  
an ejection head of the element, wherein said particles  
comprise a compound, and wherein said system is fluidly  
10 connected to a reservoir; and

a housing comprising an inlet and an outlet  
between which is formed an airflow path and in which at  
least the ejection head is disposed in the air flow path  
downstream of the inlet and upstream from the outlet,  
15 wherein the housing provides for a substantially  
unobstructed airflow between the ejection head and the  
outlet when air traverses the airflow path from the inlet  
to the outlet.

2. A device according to claim 1 wherein the compound is stored in the reservoir in a liquid formulation.

3. A device according to claim 1 wherein the  
5 compound is a pharmaceutical compound.

4. A device according to claim 3 wherein the pharmaceutical compound is selected from the group consisting of a protein, a small molecule, and a gene delivery vehicle.

10 5. A device according to claim 3 wherein the pharmaceutical compound is a protein selected from the group consisting of a hormone, a receptor, an antibody, and an enzyme.

15 6. A device according to claim 3 wherein the pharmaceutical compound is a small molecule drug or prodrug.

7. A device according to claim 3 wherein the pharmaceutical compound is a gene delivery vehicle.

8. A device according to claim 1 wherein the reservoir and particle-generating system are disposed within the housing.

9. A device according to claim 8 wherein the  
5 reservoir is aerodynamically shaped.

10. A device according to claim 1 wherein the reservoir is detachable.

11. A device according to claim 1 wherein the reservoir and particle-generating system are integrated  
10 into a single detachable unit.

12. A device according to claim 1 wherein the particle-generating system is an electronic ejection device.

13. A device according to claim 12 wherein the  
15 electronic ejection device uses heat to generate particles ejected from the ejection head.

14. A device according to claim 12 wherein the electronic ejection device uses a piezoelectric component to generate particles ejected from the ejection head.

15. A device according to claim 1 wherein the desired size of the particles is a size that allows the particles to transit to and be deposited in alveoli.

16. A device according to claim 15 wherein at least  
5 about 90% of the particles range in size from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$ .

17. A device according to claim 16 wherein at least about 60% of the particles have a mass median aerodynamic diameter of about 3  $\mu\text{m}$ .

10 18. A device according to claim 1 wherein the substantially unobstructed airflow is substantially laminar prior to exiting the housing outlet.

19. A device according to claim 1 wherein the substantially unobstructed airflow comprises a  
15 substantially homogeneous mixture of the ejected compound and air in the airflow prior to exiting the housing outlet.

20. A device according to claim 1 wherein the inner surface of the housing is proximal to the ejection head and extending to the outlet is contoured to minimize turbulence.

5 21. A method of delivering an aerosolized compound to a patient, the method comprising inhaling air which contains a compound through a device while the particle-generating system of the device is actuated, wherein said device comprises:

10 a reservoir that stores the compound;

a system comprising an entry port and an element to generate particles of a desired size for ejection from an ejection head of the element, wherein said particles comprise the compound, wherein said system is fluidly

15 connected to a reservoir; and

a housing comprising an inlet and an outlet between which is formed an airflow path and in which at least the ejection head is disposed in the air flow path downstream of the inlet and upstream from the outlet, wherein the

20 housing provides for substantially unobstructed airflow

between the ejection head and the outlet when air  
traverses the airflow path from the inlet to the outlet.

22. A method for generating an air stream comprising  
a compound according to claim 21, wherein the air is drawn  
5 from inlet to outlet.

23. A device for delivering an aerosolized compound,  
the device comprising:

a system that generates particles of a desired size  
that comprise a compound, wherein the system is fluidly  
10 connected to a reservoir, wherein the system comprises an  
entry port and an element to generate particles of the  
desired size for ejection from an ejection head of the  
element; and

a housing comprising an inlet and an outlet between  
15 which is formed an airflow path and in which at least the  
ejection head is disposed in the air flow path downstream  
of the inlet and upstream from the outlet, wherein the  
housing provides for substantially non-turbulent airflow  
between the ejection head and the outlet when air  
20 traverses the airflow path from inlet to outlet.

24. A device for delivering an aerosolized compound,  
according to claim 23, wherein the housing provides for  
substantially laminar airflow between the ejection head  
and outlet when air traverses the airflow path from inlet  
5 to outlet.